PACiS GTW

Gateway

Operation Guide

GTW/EN O/B11

PACiS Gateway
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SAFETY & HANDLING

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1. INTRODUCTION

The present document is a PACiS GATEWAYS chapter of the documentation binders. It describes the safety, handling, packing and unpacking procedures applicable to PACiS GATEWAYS software tools.

2. SAFETY

WARNING: THIS SAFETY SECTION SHOULD BE READ BEFORE COMMENCING ANY WORK ON THE EQUIPMENT.

2.1 Health and Safety

The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section and all Safety documents related to the PC and Communication networks.

2.2 Explanation of symbols and labels

The meaning of symbols and labels may be used on the equipment or in the product documentation, is given below.

2.3 Installing, Commissioning and Servicing

Equipment operating conditions

The equipment (PC and communication network supporting PACiS GATEWAYS) should be operated within the specified electrical and environmental limits.

Fibre optic communication

Where fibre optic communication devices are fitted, these should not be viewed directly. Optical power meters should be used to determine the operation or signal level of the device.

2.4 Decommissioning and Disposal

Disposal:

It is recommended to avoid incineration and disposal of the PC and the communication network supporting PACiS GATEWAYS. The products should be disposed of in a safe manner.

3. GUARANTIES

The media on which you received AREVA T&D – Automation software are guaranted not to fail executing programing instructions, due to defects in materials and workmanship, for a period of 90 days from date of shipment, as evidenced by receipts or other documentation. AREVA T&D – Automation will, at its option, repair or replace software media that do net execute programming instructions if AREVA T&D – Automation receive notice of such defects during the guaranty period. AREVA T&D – Automation does not guaranty that the operation of the software shall be uninterrupted or error free.

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In any application, including the above reliability of operation of the software products can be impaired by adverse factors, including -but not limited- to fluctuations in electrical power supply, computer hardware malfunctions, computer operating system, software fitness, fitness of compilers and development software used to develop an application, installation errors, software and hardware compatibility problems, malfunctions or failures of electronic monitoring or control devices, transient failures of electronic systems (hardware and/or software), unanticipated uses or misuses, or errors from the user or applications designer (adverse factors such as these are collectively termed "System failures").

Any application where a system failure would create a risk of harm to property or persons (including the risk of bodily injuries and death) should not be reliant solely upon one form of electronic system due to the risk of system failure to avoid damage, injury or death, the user or application designer must take reasonably steps to protect against system failure, including -but not limited- to back-up or shut-down mechanisms, not because end-user system is customised and differs from AREVA T&D – Automation' testing platforms but also a user or application designer may use AREVA T&D – Automation products in combination with other products.

These actions cannot be evaluated or contemplated by AREVA T&D – Automation; Thus, the user or application designer is ultimately responsible for verifying and validating the suitability of AREVA T&D – Automation products whenever they are incorporated in a system or application, even without limitation of the appropriate design, process and safety levels of such system or application.

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1. INTRODUCTION

This document is a chapter of PACiS Gateway documentation binder. It is the chapter Technical Data (TD) of this Product.

PACiS Gateway is a software package installed on an industrial PC to increase environmental capabilities. Technical characteristics of this PC are described thereafter.

The GI74 protocol is implemented on a specific platform based also on an industrial PC described thereafter.

For more information about hardware description see chapter HW. For more information about connection diagrams see chapter CO.

1.1 General features

A PACiS gateway can manage up to 4 protocols and up to 8 channels.

Different kinds of links are available (list is not limited to the ones given):

- PSTN MODEM (external device)
- Radio link through MODEM
- Ethernet

Features	Limit
Number of devices (UCA2 equipments-Legacy Bus equipments : C264,C268,HMI,GTW,IED)	256
Binary inputs (SP, DP, SI, 1 among N)	2048/device
Measurements	512/ device
Counters	64/ device
Output controls	1024 /device
Setpoints outputs (binary and analogue)	512 /device

TABLEAU 1 : GENERAL FEATURES

2. INDUSTRIAL PC CHARACTERISTICS

2.1 Operating System

Gateway software is intended to run under an industrial PC running under Windows 2000 Operating System with at least 256 Mo of RAM.

Using 256 Mo of RAM you will not needed to have a swap memory i.e. the gateway and the system will run in RAM.

2.2 Configuration

Reference	Designation	
9566085	SYSTEM N° 14969	PC 4U 19'
	ICP-RACK305AW	Rack 19" 4 U (413mm) - CE - for bus 14 Slots with handles for carry in front side
	ICP-ACE925AP	Supply 250 W - 84 à 240 VAC - Norms PFC
	MATROX-G450 32MO PCI	GRAPHIC BOARD PCI 32MO
	ICP-ROCKY-3701	Board PIII/CELERON PICMG Socket 370 - 4S/1P
	PENTIUM III-866FCPGA	Processor PIII-866 FCPGA FSB 100 MHz
	ICP-CF504	Ventilator Slim pour PIII CELERON
	SDRAM-32*64 PC133 512MO	MEMORY 256MO SDRAM PC133
	DD 40GO UDMA IBM	HARD DISK 40GO UDMA IBM 7200T
	CD 52X IDE	CD PLAYER ROM 52X IDE
	FDD144	Floppy driver 1,44 Mo
	ICP-PX14S2	Passive Bus 14 Slots ISA/PCI (Slots PCI on left)
	ICP-CB-USB02	Kit of Connection USB 2 Ports

TABLEAU 2 : GATEWAY CONFIGURATION

This configuration complies with the environmental constraints given hereafter.

2.3 Communication ports with SCADA

- Number of simultaneous protocols: 4
- Number of serial port by protocols: 2 (main, redundant)
- Thus 8 ports maximum on one gateway: 2 cards with 4 ports
- Number of communication port settable by SCE: 8
- Baud rate (bits/s): from 300 to 19200 settable by SCE

In the industrial PC configuration described below the motherboard has two serial communication ports. You can use them fort one communication with SCADA plus a redundant port or two communications with SCADA. For additional communication ports you will need to add a PCI or an ISA communication card into the PC.

2.4 Ethernet Communication port

The Ethernet communication port is a 10 / 100 Mbps RJ45 connector.

2.5 Rated Values

TEST	INTERNATIONAL STANDARD	Harmonised
Rated Auxiliary Voltage DC	IEC 60255-6	Minimum requirement 48 VDC, 110/125 VDC, 220/250 VDC
Rated Frequency	IEC 60255-6	50 or 60 Hz.
Rated AC Voltage	No Standard	84 à 240 VAC

2.6 DC auxiliary supply

TEST	INTERNATIONAL STANDARD	Harmonised
Supply variations	IEC 60255-6	Vn +/- 20% Vn + 30% & Vn - 25% for information
Ramp down to zero	/	From Vn down to 0 within 1mn From Vn down to 0 within 100mn
Ramp up from zero	/	From 0 up to Vn within 1mn From 0 up to Vn within 100mn
Supply interruption	IEC 60255-11	From 2ms to 100ms at 0,88Vn
40s interruption	IEC 60255-11	/
Reverse polarity	/	Continuous withstand
Ripple (frequency fluctuations)	IEC 60255-11	12% x Vn AC ripple, frequency = 100Hz or 120Hz 12% x Vn AC ripple, frequency = 200Hz for information

2.7 AC auxiliary supply

TEST	INTERNATIONAL STANDARD	Harmonised
Supply variations	IEC 60255-6	Vn +/- 20%
Dips & Short interruptions	IEC 61000-4-11	2ms to 20ms 50ms to 1s
Frequency fluctuations	IEC 60255-6	From 44 to 55Hz
Harmonics Immunity	IEC 61000-4-7	5% over the range 2^{nd} to 17^{th}

2.8 Insulation

TEST	INTERNATIONAL STANDARD	Harmonised
Dielectric	IEC 60255-5: 2000	2KV, 50Hz, 1mn CM
	IEEE C37.90.1: 1989	2KV, 50Hz, 1mn CM 1KV, 50Hz, 1mn DM
Insulation Resistance	IEC 60255-5: 2000	>100MΩ at 500VDC
HV Impulse	IEC 60255-5: 2000	Class 1: 5KV, 1.2/50μs, 0.5J, 500Ω CM on power supplies 3KV, 1.2/50μs, 0.5J, 500Ω DM on power supplies
		Class 1: 1KV, 1.2/50μs, 0.5J, 500Ω CM on communications

2.9 Environmental

TEST	INTERNATIONAL STANDARD	Harmonised
Cold Operating	IEC 60068-2-1	Test Ad: -10°C, 96h
Cold Storage	IEC 60068-2-1	Test Ad: -40°C, 96h
Dry Heat Operating	IEC 60068-2-2	Test Bd: +40°C, 96h, accurate +55°C, 2h, errors acceptable
Dry Heat Storage	IEC 60068-2-2	Test Bd: +70°C, 96h
Damp Heat Operating	IEC 60068-2-3	Test Ca: +40°C, 10 days, 93% RH
	IEC 60068-2-30	+25°C to +55°C, 93% RH, 3 cycles of 24h

2.10 Mechanical

TEST	INTERNATIONAL STANDARD	Harmonised
Vibration response (energised)	IEC 60255-21-1	Class 1
Vibration endurance (non-energised)	IEC 60255-21-1	Class 1
Shock response (energised)	IEC 60255-21-2	Class 1
Bump (non-energised)	IEC 60255-21-2	Class 1: 10g, 16ms, 2000/axis
Seismic (energised)	IEC 60255-21-3	Class 1
Drop		
no packaging	IEC 60068-2-31	Test Ec: 2 drops from 50mm corner drop, and topple test
with packaging	IEC 60068-2-32	Test Ed: 2 drops from 0.5m on each face, edge and corner

2.11 Safety

TEST	INTERNATIONAL STANDARD	Harmonised
Product Safety	CAPIEL draft Product Safety document under preparation	CE mark conformity

2.12 EMC TESTS

TEST	INTERNATIONAL STANDARD	Harmonised
Electrostatic Discharge	IEC 61000-4-2	Cover on: Class III: 8KV air discharge 6KV contact discharge
RFI Immunity-radiated	IEC 61000-4-3	Class III: 10V/m, 80 to 1000MHz Modulation: 1KHz, 80% Polarisation H & V
	ENV 50204	10V/m, 900 to 1800MHz Modulation: 50%
Fast Transient Burst	IEC 61000-4-4	Class IV on power supply: 4KV, 2.5KHz
		Class III on communications: 2KV, 5KHz
Surge Immunity	IEC 61000-4-5	Level 3 on power supply: 2KV CM / 1KV DM
		Level 3 on communication: 2KV CM
Conducted RFI Immunity	IEC 61000-4-6	10Vrms, 150KHz to 80MHz
Power Frequency Magnetic Field Immunity	IEC 61000-4-8	30A/m continuous
Damped Oscillatory Magnetic Field Immunity	IEC 61000-4-10	10A/m
High Frequency Disturbance	IEC 61000-4-12	Class III on power supply: 2.5KV CM / 1KV DM 1MHz, 400 bursts/s & 100KHz, 50 bursts/s
		Class II n communications : 1KV CM / 0,5KV DM
RFI Emissions		
Conducted Emissions	IEC 60255-25	Class A: 0.15 to 30MHz: 0.15 to 0.5MHz: 79dBμV quasi peak 0.5 to 30MHz: 73dBμV quasi peak
Radiated Emissions	IEC 60255-25	Class A: 30 to 1000MHz: 30dBμV/m at 30m or 40dBμV/m at 10m

2.13 Wiring

The connection with the PACiS Gateway is full compatible with standard RS232C.

A SCADA communication can be establish on one serial port. One more serial port is needed for redundancy.

A Null-Modem cable can be connected to a SCADA simulator or a Network Analyser.

For more information about the connection see the chapter CO.

3. SOFTWARE GATEWAY CHARACTERISTICS

3.1 Number of Data Points

Refer to § 1.1.

3.2 Response time

Time to receive a response after sending a request: 100ms

3.3 UCA2 Avalanche

The linked list that manage events can memorise 30 000 events by protocol processes.

4. GI74 CHARACTERITICS

4.1 Operating System

The GI74 software is intended to run under an industrial PC running under VxWorks.

4.2 Configuration

The industrial PC where the GI74 is running has the following configuration

Reference	Designation
2070368A07	GI74 Supply 48VDC and filter
2070368A08	GI74 Supply 110VDC and filter
2070368A09	GI74 Supply 220VAC and filter
9565913	Serial board BCOM8 (from ASE)

INDUSTRIAL PC base version
Rack AREVA GI74
CPU TEKNOR PCI 946/P3-700
Memory 128 Mo PC100 SDRAM
FDP PICMG PCI-7S version G1
Flash disk IDE 16 Mo
Cable Flash disk + adapter
Floppy driver 3,5”
Cable Floppy
Board reprise unpopulated
Cable LED
Cables COM1/COM2

TABLEAU 3 : GI74 CONFIGURATION

4.3 Communication ports with SCADA

A dedicates communication card assumes communication with SCADA: BCOM8+.

This card can manage up to four communication ports.

Baud rates: 300 to 2400

5. LIMITS AND PERFORMANCES

5.1 Exchanging message with SCADA

The responds time to a SCADA request whatever the protocol must be less than 30 milliseconds after the parameter settings phase for the parameters, synchronisation pre and post transmission times.

5.2 UCA2 acquisition

The gateway must be able to support avalanche of events without lost during a short period of time.

5.3 Time Performance

Operations	Gateway
Time between DI change of state at bay computer and gateway reception	500 ms
Time between AI change of value at bay computer and gateway reception	sampling period + 1 s
Time between gateway control initiation and DO activation	750 ms

TABLEAU 4 : TIME PERFORMANCES

6. SYSTEM DEPENDABILITY

6.1 MTBF

Device	MTBF
Gateway	50 000h

TABLEAU 5 : MTBF

6.2 Availability

Device	MTTR (in minutes)
Gateway	30 to 60

TABLEAU 6 : AVAILABILITY

INTRODUCTION

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1. INTRODUCTION

The present document is a chapter of the PACiS Gateway documentation binder. It describes the documentation's chapters you can find in the different guides, the types of applications and how to use the product. It is the Introduction (IT) chapter of this Product's manual.

2. INTRODUCTION TO PACiS GATEWAYS' GUIDES

The guides provide functional and technical descriptions of the product and of a comprehensive set of functions for the product's use and applications.

PACiS Gateways guides are divided into two volumes, as follows:

- Operation Guide: includes information on the application of the product and a technical description of its features. It is mostly intended for engineers involved in the selection and application of the product.
- Technical Guide: contains information on the installation and commissioning of the product, and also a fault finding section. This volume is intended for site engineers who are responsible for the installation, commissioning and maintenance of the product.

2.1 Chapters description

2.1.1 Safety Chapter (SA)

This chapter contains the safety instructions, handling and reception of electronic equipment, packing and unpacking of parts, Copyrights and Trademarks.

2.1.2 Introduction Chapter (IT)

This is the present document, it contains the description of each chapter of the PACiS Gateway guides. It presents a brief introduction to PACiS Gateways capabilities.

2.1.3 Functional Description Chapter (FT)

This chapter contains a description of the product. It describes the functions of the PACiS Gateway.

2.1.4 Technical Data Chapter (TD)

This chapter contains technical data, including accuracy limits, recommended operating conditions, ratings and performance data. It also lists environment specification, compliance with technical standards.

2.1.5 Communications Chapter (CT)

This chapter provides detailed information on the communication interfaces of the product, i.e. it gives the profiles of the implemented protocols.

2.1.6 HMI, Local control and user interface Chapter (HI)

This chapter contains the operator interface description, Menu tree organisation and browsing, description of LEDs and Setting/configuration software.

2.1.7 Installation Chapter (IN)

This chapter contains the installation procedures.

2.1.8 Hardware Description Chapter (HW)

This chapter contains the hardware product description.

2.1.9 Connection diagrams Chapter (CO)

This chapter contains the external wiring connections.

2.1.10 Commissioning Chapter (CM)

This chapter contains instructions on how to commission the product, including setting and functionality checks of the product.

2.1.11 Applications Chapter (AP)

This chapter gives a comprehensive and detailed description of the features of the PACiS Gateways product. This chapter includes a description of common system applications of the PACiS Gateway, practical examples on how to perform certain basic functions, suitable settings, a few typical worked examples and information on how to apply the settings to the product.

2.1.12 Maintenance, Fault finding, Repairs Chapter (MF)

This chapter advises on how to recognise failure modes, fault codes and describes the recommended actions for repair.

2.1.13 Glossary Chapter (LX)

This chapter contains lexical description of acronyms and definitions.

2.1.14 Problem Analysis Chapter (PR)

This chapter contains identification and resolution of the main problems which can occurs on the PACiS Gateway.

2.1.15 Logic Diagrams Chapter (LG)

This chapter contains logic diagrams of the PACiS Gateway.

2.2 Operation guide

This binder contains the following chapters: SA, TD, IT, HW, AP, FT, LX

2.3 Technical guide

This binder contains the following chapters: SA, TD, IT, HW, CO, IN, HI, CT, CM, RS, MF, PR, FT, LD, LX.

3. INTRODUCTION TO PACiS

T&D – Automation philosophy is to provide a full range of products, computers, gateways and IEDs products. Each of these products can be used independently, or can be integrated to form a PACiS system: a Digital Control System (DCS) SCADA system.

3.1 What are PACiS Products?

Driven by worldwide requirements for advanced applications in SCADA, Digital Control Systems, Automation, control and monitoring, T&D – Automation have designed and developed a new and comprehensive system: PACiS, specifically intended for the power process environment and electrical utility industry. It allows building of a customised solution for Control, Monitoring, Measurement and Automation of electrical processes.

This new generation of products has been specially tailored for the PACiS system. A major objective for PACiS products is to make this range as easy as possible for the customer to accept, adapt and integrate into their system and operation.

One of the key features is that this product family is based on a UCA2 client/server architecture.

3.2 Application and Scope

The Telecontrol Gateway (TG) is the PACiS control system's gateway . It provides the system with a connection to a Remote Control Point (RCP), located in a dispatching centre (SCADA), thus allowing the dispatcher to perform remote control and monitoring of the system from the SCADA.

Main functions of the gateway are:

- Transmission of remote indications from the system to the control centre.
- Transmission of remote measurements from the system to the control centre.
- Transmission of commands to the system, issued from the remote control centre.

TG and RCP communicate together by data exchanges based on a specific communication protocol. The TG label describes in fact a range of bridges, each supporting a protocol dedicated to a specific remote control type.

The communication with the SCADA uses a RS232 or Ethernet links.

The TG may be redundant in the PACiS system in order to ensure the quality of service in case of a communication failure . Moreover, it should be multi-protocol, this means it has to manage several different protocols in order to communicated with several different SCADAs.

A standardised protocol is used in accordance with the choice of each project's SCADA supplier.

3.3 Gateway environment

The PACiS gateway is a dedicated device (Windows PC): do not confuse it with the remote control interface function which may be included in the computers.

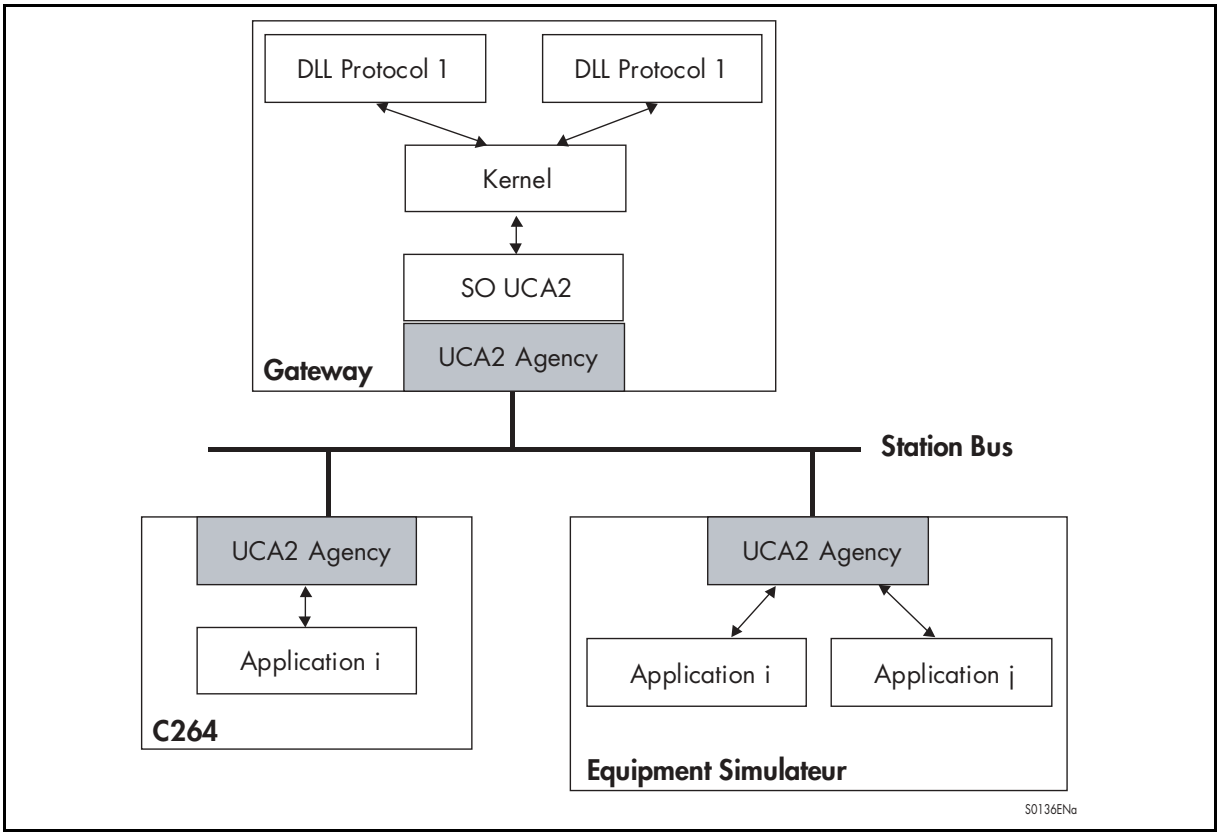

FIGURE 1 : GATEWAY ENVIRONMENT

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HARDWARE DESCRIPTION

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1. INTRODUCTION

This document is a chapter of PACiS Gateway documentation binder. It is the chapter Hardware Description (HW) of this Product.

To get further details about the hardware configuration you can see the User's Manual furnish with the industrial PC.

2. HARDWARE DESCRIPTION

2.1 Concept

To increase environmental capabilities of the PACiS Gateway, it runs on an industrial PC. It is a steel rugged chassis specially designed to work under harsh environment for high reliability application.

The hardware description of this PC configuration is done hereafter.

This PC is equipped with the following modules:

Reference	Designation	
9566085	SYSTEM N° 14969	PC 4U 19'
	ICP-RACK305AW	Rack 19" 4 U (413mm) - CE - for bus 14 Slots with handles for carry in front side
	ICP-ACE925AP	Supply 250 W - 84 à 240 VAC - Norms PFC
	MATROX-G450 32MO PCI	GRAPHIC BOARD PCI 32MO
	ICP-ROCKY-3701	Board PIII/CELERON PICMG Socket 370 - 4S/1P
	PENTIUM III-866FCPGA	Processor PIII-866 FCPGA FSB 100 MHz
	ICP-CF504	Ventilator Slim pour PIII CELERON
	SDRAM-32*64 PC133 512MO	MEMORY 256MO SDRAM PC133
	DD 40GO UDMA IBM	HARD DISK 40GO UDMA IBM 7200T
	CD 52X IDE	CD PLAYER ROM 52X IDE
	FDD144	Floppy driver 1,44 Mo
	ICP-PX14S2	Passive Bus 14 Slots ISA/PCI (Slots PCI on left)
	ICP-CB-USB02	Kit of Connection USB 2 Ports

TABLEAU 1 : GATEWAY CONFIGURATION

2.2 Hardware overview

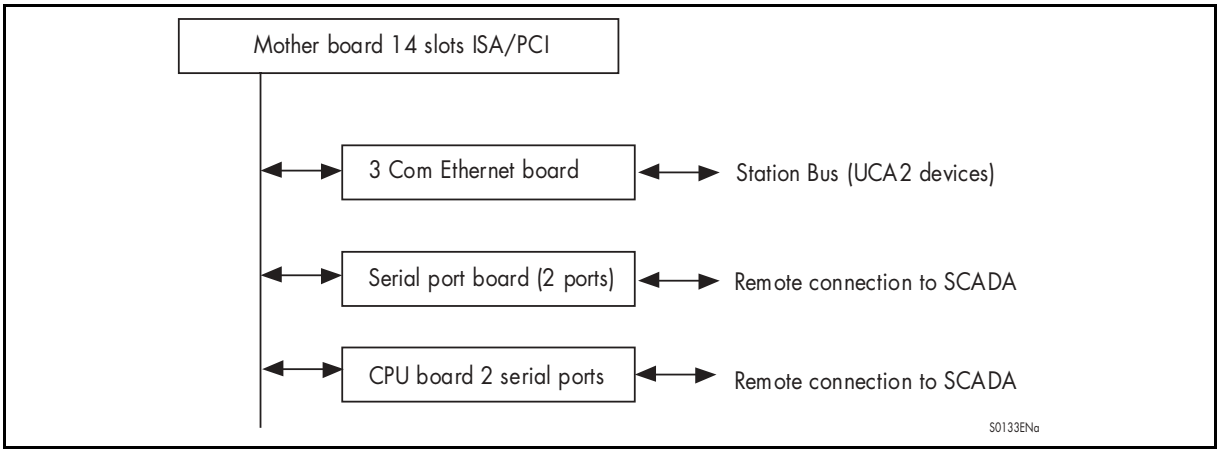
Mother board 14 slots ISA/PCI
3 Com Ethernet board
Station Bus (UCA2 devices)
Serial port board (2 ports)
Remote connection to SCADA
CPU board 2 serial ports
Remote connection to SCADA
S0133ENa

FIGURE 1 : HARWARE OVERVIEW

2.3 PACiS Gateway

2.3.1 Front panel overview

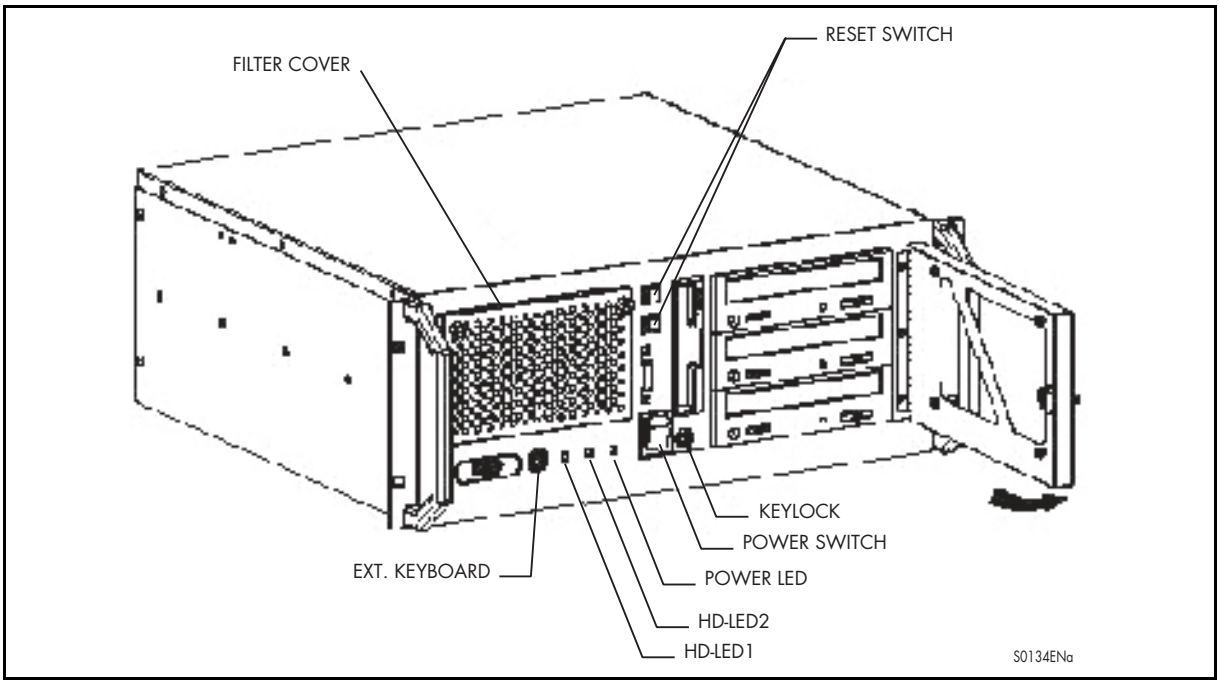

FIGURE 2 : FRONT PANEL

- EXT. KEYBOARD: External Keyboard is optional.
- HD LED 1and 2: Is the hard disk led that indicates accesses are made to the hard disk.
- POWER LED: This led is green to indicate when the PC is powered on.
- POWER SWITCH: Is a monostable button off the ATX alimentation that is a 3.3 VDC alimentation. Pushing this button for the first time you will power on the PC pushing this button the second time you will turn off the alimentation.
- RESET SWITCH: This button is here to reset the PC.
- FILTER COVER: See the user's manual document to know how to replace the filter cover.

2.3.2 Rear panel description

You will needed to take care of keeping some place for wiring connections.

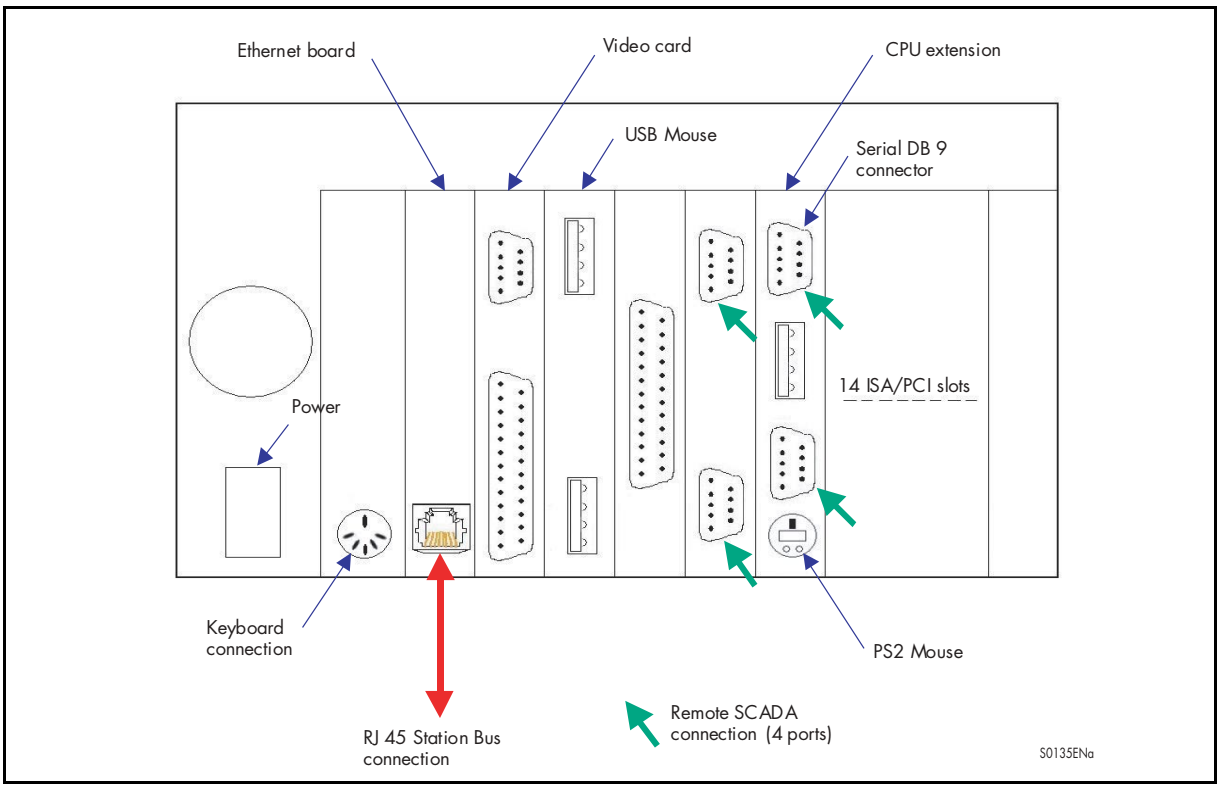

FIGURE 3 : REAR PANEL OVERVIEW

2.3.3 Dimensions

431mm x 413.5mm x 176mm

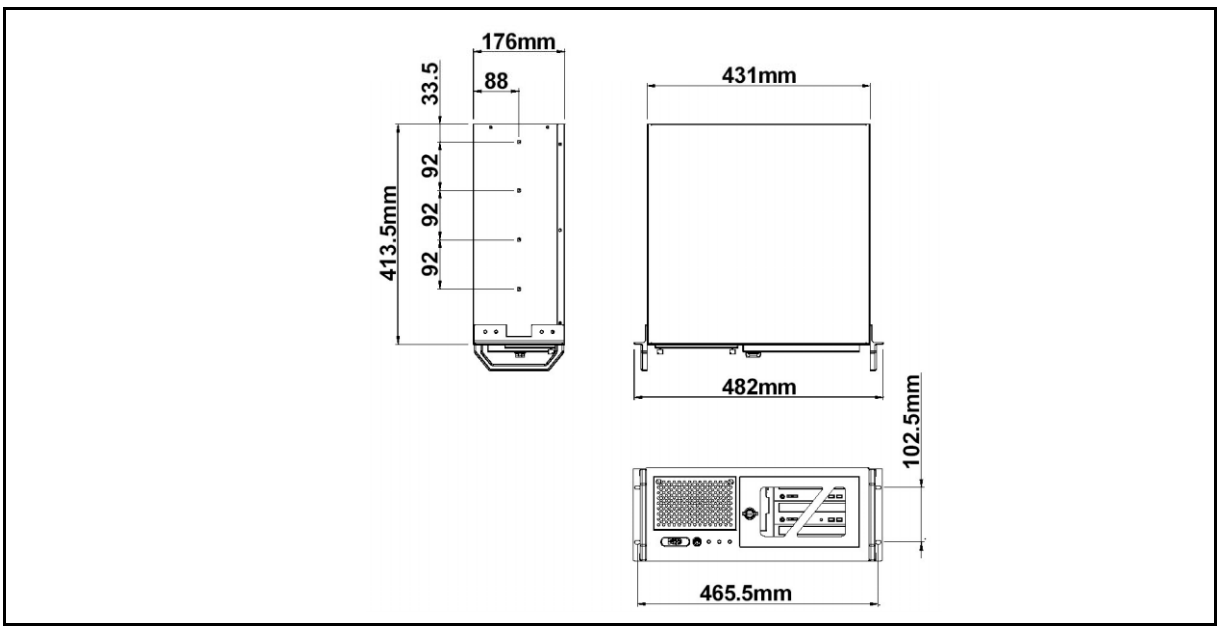

FIGURE 4 : INDUSTRIAL PC DIMENSIONS

2.3.4 Power supply

This industrial PC can be furnished with tree types of power supply, 230 VAC, 110 VDC or 48 VDC. To further details about connection see the chapter CO.

FUNCTIONAL DESCRIPTION

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1. INTRODUCTION

1.1 Scope of the document

This document is a chapter of PACiS Gateway documentation binders. It is the functional description (FT) of the gateway between PACiS system and SCADA. The hardware description is defined in HW (Hardware) chapter. The product capabilities, performances, environmental limits are grouped in TD (Technical Data) chapter.

1.2 Main features

The PACiS Gateway is in charge of data exchange between two networks : the PACiS Network with its UCA2 devices and the dedicated network with remote SCADA (Supervisory Control And Data Acquisition). Several protocols are implemented to make available communication with SCADA.

The implemented SCADA protocols are :

- IEC 60870-5-101
- IEC 60870-5-104
- Serial link GI74
- Modbus

2. PROCESS INTERFACE

In PACiS system, direct process acquisition is done by MiCOM C264 Computers and IEDs. All data are presented on the Station BUS UCA2. The PACiS Gateway get all supervisory information on SBUS network and stores them into its kernel. Its is then able to transmit data to SCADA when it ask for them. The PACiS Gateway has several protocols implemented into DLL. There is one DLL started per communication link with the SCADA to allow possibly several way of transmission of the same data.

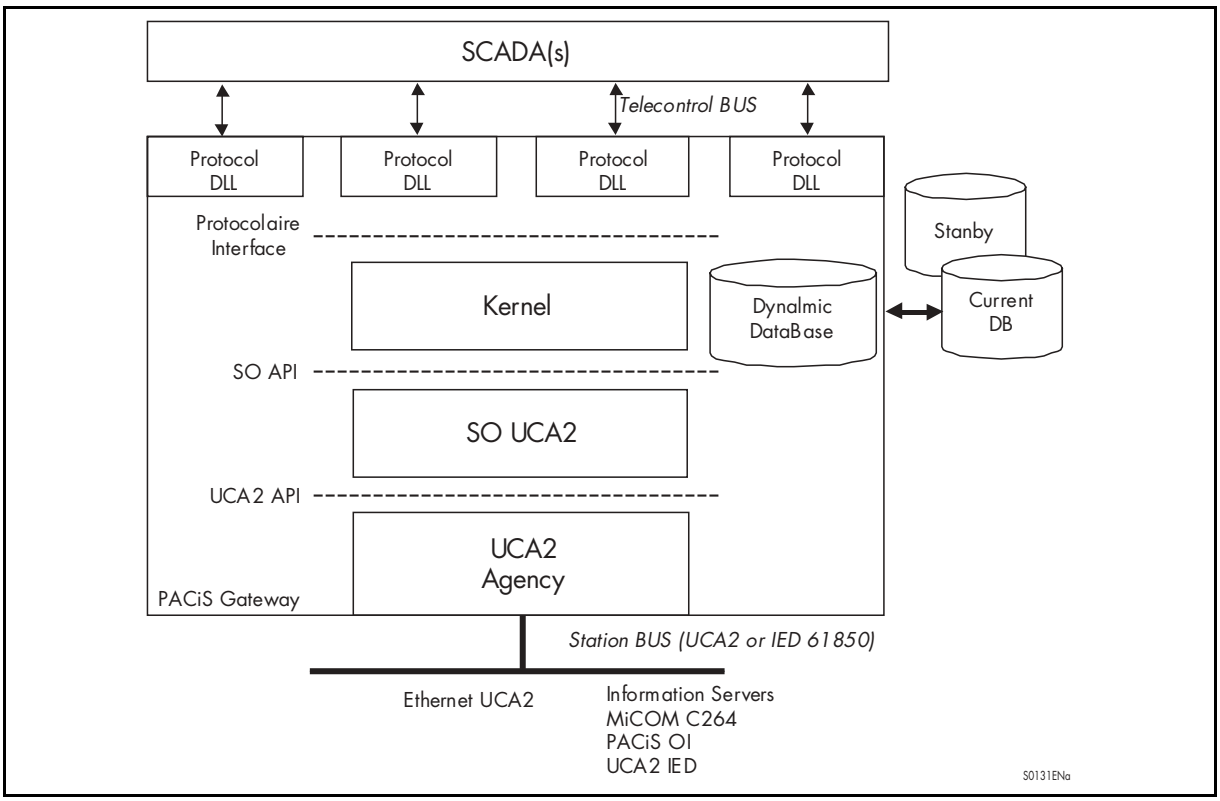

FIGURE 1 : GATEWAY ARCHITECTURE

PACiS Gateway is then composed in tree modular parts:

- Acquisition DLL:
  - UCA2 agency
  - SO UCA2
- Kernel storing data changes
- Protocol DLL

To know the data to catch on SBUS and their respective mapping on SCADA Protocol, the gateway use a current database loaded from its hard disk at start-up. A second or stand-by database is used for new database download while current is running.

3. PACiS GATEWAY MANAGEMENT

3.1 Configuration management

The Configuration files are divided into two main parts:

- SBUS mapping (Station Bus)
- TBUS mapping (Telecontrol Bus)

The kernel reads the configuration file during the initialisation phase of the gateway application. It subscribes to SBUS predefined data, then runs as much Protocol DLL processes as defined in configuration and product definition (each protocol DLL is under license).

3.1.1 Configuration tool

To operate the PACiS gateway needs a configuration file or database. It is generated by PACiS SCE (System Configuration Editor). The generated database has a specific configuration version incremented when creating or updating the control system.

The database is a zip file that contains all data needed to operate the gateway. It is to be noticed that there is no on line settings or parameterisation of the PACiS Gateway.

Details of the configuration process are described in the AP chapter.

3.1.2 Downloading tool

PACiS SCE provides a configuration file that has to be downloaded into the gateway possibly through SBUS Ethernet network. This operation is done thanks to PACiS SMT (System Management Tool).

Without database or in case of fault the PACiS gateway remains in a maintenance mode. PACiS SMT has the following features:

- to download a stand-by database
- to switch stand-by database to operational one
- to change by operator request the operating mode between maintenance and operational.

3.2 Database management

The PACiS gateway has two databases, the current one (operational) and standby one (or reserved). New database is downloaded over the standby one without interrupting gateway normal behaviour.

Starting with a current database, PACiS gateway checks database coherency to its inner needs.

When SBUS communication starts, PACiS gateway checks communication data coherency between itself and other devices on UCA2.

It checks if UCA2 servers are present on Ethernet, if their database version and system revisions are the same.

After the database compatibility checking it subscribes on UCA2 network data to transmit to SCADA.

3.3 Time management

The data received from the SBUS are time tagged from UCA2 servers. Servers are synchronised.

PACiS gateway supports SCADA synchronisation. Because several protocols can run simultaneously, this synchronisation is not transmitted to SBUS. The time difference between system and one SCADA synchronisation link is added to events transmitted to this particular link.

3.4 Exploitation mode management

PACiS Gateway is designed to medium and large station where operator interface are often present at local room, or bay level. To avoid conflict between these control points each control into the electric station is subject to checking.

Three levels of checkings are managed by the gateway :

- Remote/Local substation
- SBMC mode
- Taking control

3.4.1 Substation Remote/Local mode checking

PACiS gateway checks the Local/Remote Substation mode to allow SCADA control only when control is configured for exploitation check and Substation is in Remote mode.

The Remote/Local bay mode is checked by the computer.

3.4.2 SBMC mode checking

When leading commissioning operation, a bay can be set in SBMC (Site Based Maintenance Control). Even if substation is in remote, any control received from SCADA and configured for SBMC is rejected to SCADA and not transmitted to the bay.

When a bay is set in SBMC (it means that some tests are running on it), the supervisory data from the bay can be configured to be filtered by PACiS gateway to the SCADA. Since and while the bay is in SBMC, its data are transmitted to a “suppress SBMC” state to its SCADA link avoiding to transmit non-significant events. Switching off the SBMC the SBMC data are transmitted to SCADA with their current value.

3.4.3 Taking Control

A specific SCADA control called “Taking Control” allows the SCADA to switch substation exploitation mode from Local to Remote and to take control on one SCADA port. Only controls received on this port will be accepted by PACiS gateway.

3.5 Redundancy management

PACiS Gateway can have several kind of redundancy into the system:

- Two identical gateway
- Redundant SBUS with special Ethernet switch (managed by the board)
- Redundant protocols on same gateway (identical or same protocol with separate dynamic data to transmit when asked by SCADA)
- Dual link protocol (same protocol and data on redundant link managed by SCADA)

Acquisitions of system information are sent simultaneously to the two gateways. The SCADA is in charge of choosing the gateway it wants to communicate with.

4. COMMUNICATION LAYER

PACiS gateway has two different types of communications:

- Telecontrol Bus (T-Bus) to SCADA,
- Station Bus (S-Bus) to station

That can use different physical means.

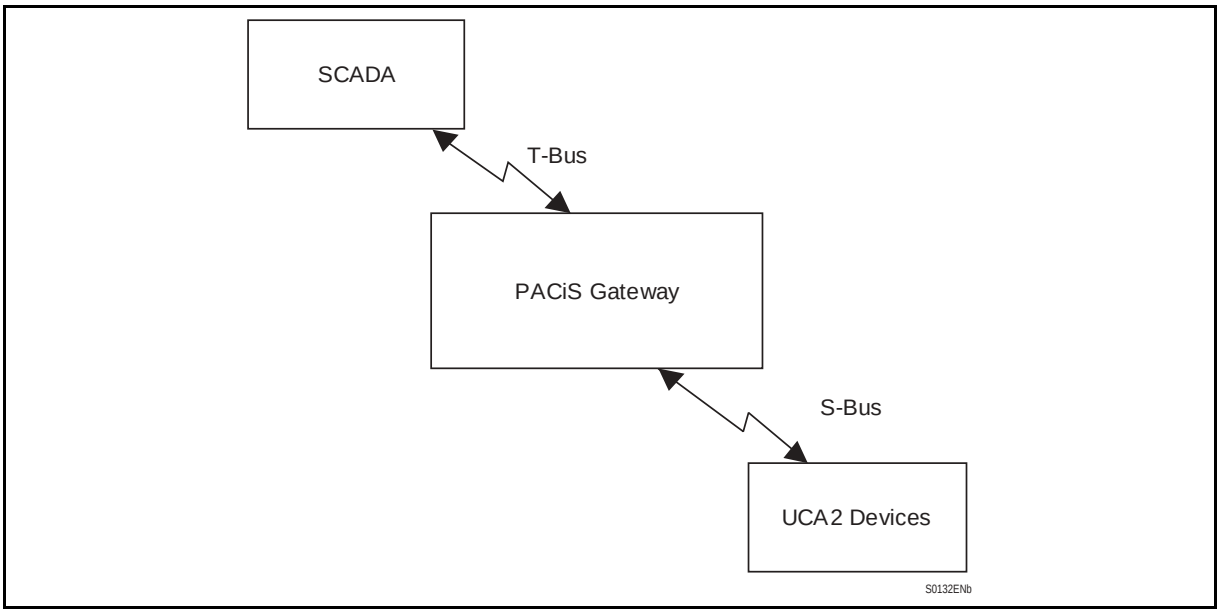

FIGURE 2 : COMMUNICATIONS

4.1 Telecontrol bus

PACiS Gateway behaves as a slave into master/slave protocol. The chapter CT gives the associate companion standard or supported function.

Protocols:

- GI-74
- IEC 60870-5-101 (T101)
- IEC 60870-5-104 (T104)
- ModBus MODICON

OPC, DNP3 not yet implemented.

Link layer:

- RS 232
- Ethernet 10 or 100 Mbps for T104

Physical support:

- Copper (DB9 connector)
- Optical fibber (multimode or singlemode)

Number of communication links: up to four different protocols and up to 2 channels per protocol can be configured on a per PACiS gateway basis.

4.2 Station bus

PACiS Gateway behaves mainly as a client of other UCA2 devices : MiCOM Computers, UCA2 IED, PACiS OI.

Protocols:

- UCA2,

Link layer: Ethernet 10 or 100 Mbps

Physical support: Copper twisted pair (RJ45 connector)

Number of communication links: one (an Ethernet rail-din switch can be used for redundancy Ethernet network).

4.3 Lost of communication

PACiS Gateway stores SBUS data changes in its kernel. It is then able to answer quickly to any kind of query from a remote master. It is a key advantage when communication with SCADA is subject to disconnection and reconnection (PSTN network).

PACiS Gateway detects TBUS disconnection from SCADA (time out) and provides this information on UCA2 to the central archiving/logging (or other gateway).

SBUS disconnection or server disconnection is directly detected. From its database, Gateway set all server data to unknown for its upper SCADA communication. Depending of TBUS protocol “Unknown” state of data is translated to specific invalid state.

Detection of disconnection, and data invalidity is also transmitted to SCADA when it is an IED on Legacy BUS under a MiCOM computer that is disconnected. Difference is that unknown state is then emitted by the UCA2 server and not by gateway itself.

5. SBUS ACQUISITION

If server is connected with the same database version the PACiS Gateway subscribes to the data defined in its database.

5.1 UCA2 acquisition

The PACiS Gateway acquires data from UCA2 Ethernet network using only UCA2 REPORT mechanism. The Gateway does not translate UCA2 GOOSE.

The UCA2 REPORT acquisition done by the gateway gets:

- data value
- data state or quality attribute (validity and several kind of invalid state)
- time tag of last data value change
- time tag quality attribute (server synchronised or not when event occur)

Data quality defines if data is valid or several kind of invalidity: unknown when disconnected, Saturated, Undefined, …. Invalid quality attribute is translated to specific SCADA invalid coding when correspondence exists.

REPORTS are received with their RFI (Reason For Inclusion): periodic, spontaneous state/value change or following control… This Reason can be translated with COT (Cause Of Transmission) or equivalent to SCADA protocols.

Interested readers can refer to SII document for REPORT mechanism.

5.2 UCA2 supported Common Class

PACiS Gateway can pick up the following kind of data or common class on UCA2. Their conversion to SCADA protocol is function of the protocol used (MODBUS MODICON has no mechanism for time tag transmission, unknown state on UCA2 is converted by IV bit set on T101…). The upper communication is detailed in protocol companion standard into the CT (Communication) chapter.

UCA2 information	UCA2 Class	Comment
Single-point indication (SI)	SI	With time tag, with quality attribute on DP on time tag
Double-point indication (SIT)	SIT	With/without time tag
Step position indication (transformers)	AI	With/without time tag
Measurement value (AI)	AI WYE DELTA	With/without time tag Type: digital, analogue, 1 among N Formats: floating point, scaled, normalised, integer
Integrated totals (counters) (Accl)	Accl	With/without time tag
Single control	BO	Direct execute
Double control	DCO	Direct execute
Select Before Operate	SBO	Two step control like select/execute control
Regulating step control	AO	Direct or Select/execute

TABLEAU 1 : DATA MANAGEMENT

5.3 UCA2 Controls

PACiS Gateway supports Common Class expressed before (BO, DCO, SBO). Basically it writes the corresponding control onto the server common class and waits control termination (possibly with NACK codes) to translate it to upper SCADA control termination.

PACiS System defines Bypass controls on common control class by specific attribute. Bypass control has usually no equivalence on common SCADA protocol, also each bypass control that may need to be defined is treated as a specific protocol control.

GLOSSARY

CONTENT

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2.	**LEXICAL**	**4**

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1. INTRODUCTION

The present document is a PACiS Gateway chapter of the documentation binder. It is the lexical chapter (LX) of this Product.

2. LEXICAL

AC	Alternative Current
AccI	Accumulator Input
AI	Analogue Input
AO	Analogue Output
API	Application program interface
ASDU	Data Unit of Application Service
ASE	Applied System Engineering
BD	Data Base
BO	Binary Output
CR	Change Request
DAC	Data Acquisition component of the GPT
DBID	Databases Identity Brick
DCO	Double Control Output
DELTA	Phase to phase delta values
DI	Device Identity Brick
DIAG	Diagnostic Brick
DLL	Dynamic Link Library. Available on Windows 2000. A feature that allows executable code modules to be loaded on demand and linked at run time. This enables the library-code fields to be updated automatically, transparent to applications, and then unloaded when they are no longer needed.
DSL	Software Specification Document
DVP	Design Validation Plan
ECDD	Coherent Extract of Distributed Data
FR	Fault Report
GLOBE	GLOBE Brick
GPT	Generic Protocol Translator software, supplied by ASE
GTW	Gateway
OMM	Operating Mode Management
RA	Anomaly Report
RCC	Remote Control Computer
RCP	Remote Control Point
SCADA	Supervisory Control And Data Acquisition
SCE	System Configuration Editor
SI	Status Input Single Bit
SIG	Status Input Group
SIT	Status Input Double Bit
SO	Sub-driver interface
SVTF	Software Validation Test Folder
TBC	To Be Completed

TC	Telecontrol
TG	Telecontrol Gateway
TM	Analogue Measurement
TS	Logic position
WYE	3 phases + neutral AI values

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